

Lockheed Martin Corporation

**Draft Work Plan – Sampling
and Analysis Plan for Air
Monitoring**

Lockheed Martin Site
The Dalles, Oregon

3 July 2012



Lynden J. Peters
Project Manager

Mike Risher
Senior Engineer

Connie Cole
Senior Scientist

Work Plan – Sampling and Analysis Plan

Lockheed Martin Site
The Dalles, Oregon

Prepared for:
Lockheed Martin Corporation

Prepared by:
ARCADIS U.S., Inc.
Rosehill Office Park 1
8725 Rosehill
Suite 350
Lenexa
Kansas 66215
Tel 913 492 0900
Fax 913 492 0902

Our Ref.:

Date:
3 July 2012

This document is intended only for the use of the individual or entity for which it was prepared and may contain information that is privileged, confidential and exempt from disclosure under applicable law. Any dissemination, distribution or copying of this document is strictly prohibited.

1.	Background	1
1.1	Objectives	1
2.	Field Monitoring Methodology	3
2.1	RCRA Landfill Vents and CERCLA Landfill Sumps	3
2.2	RCRA Landfill Surface and CERCLA Landfill Sump Vicinity	3
2.3	RCRA Landfill Perimeter and CERCLA Landfill Perimeter	4
2.4	Monitoring Procedures	4
3.	Sampling Methodology and Methods	5
4.	Reporting	6

Tables

Table 1- Air Monitoring Methods

Figures

Figure 1 – Site Layout

Figure 2 – RCRA Landfill

Figure 3 – CERCLA Landfill

1. Background

ARCADIS U.S., Inc. (ARCADIS) proposes to conduct an air monitoring event at the Resource, Conservation and Recovery Act (RCRA) and Comprehensive Environmental Response, Compensation and Recovery Act (CERCLA) landfills located on the Lockheed Martin Corporation (LMC) site in The Dalles, Oregon. ARCADIS conducts on-going Operation and Maintenance (O&M) activities at the site on behalf of LMC pursuant to Post Closure Permit No. ORD 052 221 025 issued by the Oregon Department of Environmental Quality (ODEQ).

1.1 Objectives

The purpose of the monitoring event is to provide a screening assessment of potential gas disbursement from three gas vents located on the RCRA landfill and within the manholes and lift stations located adjacent to the CERCLA landfill and to address potential exposures to site workers, offsite industrial workers, or residents to landfill gases. Current land use near the landfills is industrial/commercial and residential exposure is considered only to be conservative. Close to the landfill vents gases could potentially have either asphyxiation or explosivity characteristics. Toxicity will be evaluated onsite with respect to short term exposure to site workers (using Occupational Safety and Health Administration (OSHA) standards) and at the fence line using United States Environmental Protection Agency (USEPA) regional risk screening levels (RSLs) for industrial air, as a conservative surrogate for offsite receptors since the nearest receptors are industrial/commercial. The work plan has been developed to address the input received from Christy Brown in the e-mail to Frederick Moore dated June 18, 2012.

Based on these objectives, this work plan has been designed to address exposure pathways by assessing the following potential exposure hazards:

RCRA Landfill Vent Caps and CERCLA Landfill Sumps – Concentration measurements from the vent caps and landfill sumps will be obtained to characterize the source compounds within the landfill for which dispersion could be estimated. These data do not reflect onsite receptor exposures.

RCRA Landfill Surface and CERCLA Sump Vicinity – The exposure concern associated with the RCRA landfill surface and CERCLA sump vicinity is considered to be an intermittent site worker exposure. Therefore these locations will be assessed to determine potential exposure to a site worker and gases will be tested for both



explosive and toxicity characteristics. The sample locations chosen to address this exposure pathway will be at a distance of one horizontal foot from the RCRA landfill vent caps at a height above the landfill surface of approximately 5 feet (representative of the breathing zone). Similarly, for the CERCLA landfill sumps samples will be taken at a distance of one horizontal foot from the sump cover at a height of approximately 5 feet above ground surface.

RCRA Landfill Perimeter and CERCLA Landfill Perimeter – The concern associated with the RCRA and CERCLA landfill perimeters is considered to be potential exposure to industrial workers or trespassers at the perimeter of the landfill fences, and therefore gases will be tested for toxicity.

In accordance with USEPA direction provided by Region X staff in the June 18, 2012 e-mail, the gases to be monitored at the landfills are:

1. Methane
2. Oxygen
3. Lower Explosive Limit
4. Hydrogen Sulfide
5. Carbon Dioxide
6. Hydrogen Cyanide
7. Hydrogen
8. Nitrogen
9. Hydrogen Fluoride
10. Acetylene
11. Phosphine
12. Ammonia

These gases will be tested for in accordance with the stated objectives to determine possible presence and/or concentrations and will be assessed and reported with regard to the exposure scenarios described above.

2. Field Monitoring Methodology

The structure and layout of the RCRA and CERCLA landfills in relation to the site as a whole and to the City of The Dalles is shown on Figure 1. Both landfills are secured against un-authorized entry and are posted to discourage potential trespassing. As shown on Figure 1, the landfills are located adjacent to the area formerly occupied by the Northwest Aluminum Company (NAC) facility. The area surrounding the former NAC plant consists of light industrial property on all sides.

2.1 RCRA Landfill Vents and CERCLA Landfill Sumps

Concentrations of oxygen-depleting gases and explosive gasses will be assessed at both the RCRA landfill vents (within the vent structure) and at the CERCLA landfill sumps (within the sumps) by testing with hand-held instruments for the following gases; methane, oxygen, carbon dioxide, hydrogen sulfide, and hydrogen. Nitrogen content will be calculated by subtracting major gas percentages from the typical concentration of nitrogen in ambient air. Explosive gas results will be compared to lower explosive limits (LELs). Remaining gases will be tested for using either hand held instruments or by laboratory methods. The air flow through the vents will be qualitatively assessed through the use of a smoke test at the vent annulus.

RCRA Landfill gas measurements will be collected at the three gas vent locations as indicated on Figure 2 and as described above. The venting system on the RCRA Landfill was designed to allow gases to collect in a sand layer under the high density polyethylene (HDPE) cap and be directed to the vent pipes. The vent pipes were designed with perforated caps to allow the collected gases to vent from the landfill into ambient air.

CERCLA Landfill gas measurements will be collected from Manholes 2 and 4 and Lift Stations 1 and 2 (Figure 3). No physical entry into the manholes or lift stations will be required to obtain the monitoring results. Data will be collected via tubing from 10 feet below the surface elevation.

2.2 RCRA Landfill Surface and CERCLA Landfill Sump Vicinity

Activities will be initiated with a complete site reconnaissance using a hand held meter placed approximately 2 feet above the ground surface of each landfill perimeter to determine if any detectable levels of gases of concern are present. Measurements will



be recorded on approximately 200 foot centers to document the findings of the reconnaissance monitoring.

The purpose of this activity is to assess the general exposure potential of onsite workers implementing this sampling and analysis plan. Ambient air quality will be assessed adjacent to the RCRA landfill vents (at one horizontal foot of the vent opening) at a height of 5 feet and at one horizontal foot from the sump edge and 5 feet in height from ground surface of the CERCLA landfill sump. In accordance with the objectives, the ambient air at these locations will be tested to determine both the potential explosive atmosphere (using hand held monitors) and potential toxicity exposure by assessing the following gases in addition to those tested for explosivity: hydrogen fluoride, acetylene, phosphine, and ammonia (samples taken to an analytical laboratory).

2.3 RCRA Landfill Perimeter and CERCLA Landfill Perimeter

In accordance with the objectives listed above, ambient air quality will also be assessed at one point on the outside perimeter of the security fence at both the RCRA landfill and the CERCLA landfill to address potential industrial or trespasser exposure. The sampling point will be determined based upon field conditions at the time of sampling. The nearest downwind location from either a vent (RCRA landfill) or sump (CERCLA landfill) will be used if wind is present. If conditions are still, a sample location will be chosen that reflects the closest point to a habituated industrial or business location. The full suite of gases listed above will be tested for both LEL conditions (hand held monitor) and for toxicity characteristics. As noted previously, nitrogen will be estimated based on the major gas content determined during testing.

To assess potential explosive conditions, gas composition will be measured and recorded using a GasAlertMicro5™, RKI Eagle monitor (or equivalent). The GasAlertMicro5™ and RKI Eagle monitors are hand-held, multiple gas monitors. The monitors measure concentrations of methane (CH₄), oxygen (O₂) (LEL), hydrogen sulfide (H₂S) and carbon dioxide (CO₂). Hydrogen cyanide will be measured with a GasAlertMicro™ or equivalent monitor.

2.4 Monitoring Procedures

All monitors will be calibrated per manufacturer's instructions before the monitoring event. Manufacturer's instructions for calibration and purging will be followed during the real time monitoring event.



Monitoring will be conducted according to the following procedure:

- Weather conditions will be noted at time of monitoring, particularly wind direction and speed. Barometric pressure will be determined prior to sampling, and sampling will only be conducted under falling barometric conditions as this will be the mostly likely scenario where outflow conditions would be present at the landfill vents.
- The monitor will be checked prior to each reading and zeroed if necessary.
- Monitor tubing will be inserted into the gas vent, extending the tubing up into the U-shaped bend in the vent at the RCRA landfill vents. Monitoring tubing will be inserted 10 feet below ground surface at the CERCLA sumps (tubing will be inserted through existing vent ports or by shifting the sump cover to allow access).
- Read and record concentrations of methane, carbon dioxide, hydrogen sulfide, oxygen and hydrogen cyanide measured by the monitors. Purging of the monitors is required until the readings stabilize.
- Extract the tubing from the vent pipe.
- Read and record concentrations of methane, carbon dioxide, hydrogen sulfide, oxygen, and hydrogen cyanide measured by the monitors at 1 foot downwind and 5 feet above the exhaust opening of the gas vent at the RCRA landfill vents and one foot downwind and 5 feet above the sump covers at the CERCLA landfill. Gases being collected for toxicity analyses requiring laboratory analysis will be collected after hand held gas monitoring is completed.
- Read and record concentrations of methane, carbon dioxide, hydrogen sulfide, oxygen, and hydrogen cyanide measured by the monitors at the outside perimeter sampling location at both the RCRA landfill and the CERCLA landfill as described previously. Gases being collected for toxicity analyses requiring laboratory analysis will be collected after hand held gas monitoring is completed.

3. Sampling Methodology and Methods

Specific sampling methodologies are established in Table 1 – Air Monitoring Methods. This table is divided into three categories:

1. Vent/Sump Testing
2. Site Worker ambient Air Testing
3. Industrial Worker Ambient Air Testing

The table specifies how each analyte will be sampled and measured. Information on method detection limits and screening levels utilized for assessment purposes is included in the table. Gas measurements collected as part of this assessment will be done by either real-time hand held data monitors or by sample collection in the field followed by analyses through laboratory methods.

4. Reporting

A summary report will be prepared upon tabulation of the monitoring data. The report will summarize the air monitoring activities and will present the monitoring results for the air samples in tabular format.

Sample results pertaining to those gases determined by real time air monitors will be compared to LEL levels, where applicable, and at a conservative basis of 10% of the LEL at both fence line ambient air measuring locations. The comparison of gases recorded at the fence line to 10% of the LEL is considered a very conservative approach in regard to potential industrial worker exposure as it relates to explosivity characteristics.

Gases tested by laboratory methods will be compared to USEPA Regional Screening Levels (RSLs) for both Resident and Industrial Air. Proposed screening levels for the gases are shown on Table 1.

The report will be submitted to the ODEQ and the USEPA within 21 days of receipt of laboratory analytical data. Field data will be provided to the ODEQ as soon as possible upon completion of the real time monitoring event, but no later than five days after the completion of the field work.

Tables



Table 1. Air Monitoring Methods

			Vent/Sump Testing				Site Worker Ambient Air Testing			Industrial Worker Ambient Air Testing			
Analyte Name	Analyte Abbreviation	Reason for Measurement	Vent and On-Site Method	On-Site Screening Level****	Source for Screening Level	DL/PQL	On-Site Screening Level	Source for Screening Level	DL/PQL	Fence Line Screening Level	Source for Screening Level	Ambient Method	DL/PQL
Methane	CH ₄	Explosive	GasAlertMicro 5 [®]	5.1%v/v LEL	N/A	0.1% v/v	5.1%v/v LEL	N/A	0.1% v/v	5.1%v/v LEL	N/A	GasAlertMicro 5 [®]	0.1% v/v
Oxygen	O ₂	Asphyxiant	not necessary*	if ≤ 19.5% v/v	N/A	N/A	if ≤ 19.5% v/v	N/A	N/A	if ≤ 19.5% v/v	N/A	GasAlertMicro 5 [®]	0.1% v/v
Lower Explosive Limit	LEL	Explosive	GasAlertMicro 5 [®]	% depends on gas	N/A	0.1% v/v	% depends on gas	N/A	0.1% v/v	% depends on gas	N/A	GasAlertMicro 5 [®]	0.1% v/v
Hydrogen Sulfide	H ₂ S	Toxic	GasAlterMicro 5 [®]	50 ppm ceiling C = 10 ppm	OSHA 1910.100 Table Z-2, peak	0.1 ppmv	50 ppm ceiling C = 10 ppm	OSHA 1910.100 Table Z-2, peak	0.1 ppmv	8.8 ug/m ³	EPA Regional Screening Level*** (RSL) Summary Table April 2012, Industrial Air	ASTM-D-5504 (Tedlar bag)	4 ppbv (5.6 ug/m ³)
Carbon dioxide	CO ₂	Asphyxiant	not necessary*	5000 ppm, 9000 mg/m ³	OSHA, 1910.100 Table Z-1, 8 hour TWA	N/A	5000 ppm, 9000 mg/m ³	OSHA, 1910.100 Table Z-1, 8 hour TWA	N/A	N/A**	N/A	GasAlertMicro 5 [®]	50 ppmv
hydrogen cyanide	HCN	Toxic	GasAlertMicro 5 [®]	10 ppmv, 11 mg/m ³ ST = 4.7 ppm	OSHA 1910.100 Table Z-1, 8 hour TWA	0.1 ppmv	10 ppmv, 11 mg/m ³ ST = 4.7 ppm	OSHA 1910.100 Table Z-1, 8 hour TWA	0.1 ppmv	3.5 ug/m ³	EPA Regional Screening Level*** (RSL) Summary Table April 2012, Industrial Air	EPA OTM-029 ex CTM- 033	2 ppbv 2.2 ug/m ³
hydrogen	H ₂	Explosive	GasAlertMicro 5 [®]	4.0% v/v LEL	N/A	0.1% v/v	4.0% v/v LEL	N/A	0.1% v/v	4.0% v/v LEL		GasAlertMicro 5 [®]	0.1% v/v
nitrogen	N ₂	Balance gas	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A		N/A	N/A
hydrofluoric acid	HF	Toxic	NIOSH 7906	3 ppm (2.46 mg/m ³)	TWA	ug/m ³	3 ppm (2.46 mg/m ³)	TWA	ug/m ³	61 ug/m ³	EPA Regional Screening Level*** (RSL) Summary Table April 2012, Industrial Air	NIOSH 7960	2.5 ug/m ³
acetylene	C ₂ H ₂	Explosive/Toxic	GasAlertMicro 5 [®]	2.5% v/v LEL	N/A	0.1% v/v	2.5% v/v LEL	N/A	0.1% v/v	2.5% v/v LEL		GasAlertMicro 5 [®]	0.1% v/v
phosphine	PH ₃	Toxic	GasAlertMicro 5 [®]	300 ppbv, 400 ug/m ³ ST = 1 ppm	OSHA 1910.100 Table Z-1, 8 hour TWA	100 ppbv (139 ug/m ³)	300 ppbv, 400 ug/m ³ ST = 1 ppm	OSHA 1910.100 Table Z-1, 8 hour TWA	100 ppbv (139 ug/m ³)	1.3 ug/m ³	EPA Regional Screening Level*** (RSL) Summary Table April 2012, Industrial Air	OSHA ID-180	0.009 ppm for a 36-L air sample (12.5 ug/m ³)
ammonia	NH ₃	Toxic	GasAlertMicro 5 [®]	50 ppmv, 35 mg/m ³ ST = 35 ppm	910.100Table Z-1, 8 hou	0.1 ppmv	50 ppmv, 35 mg/m ³ ST = 35 ppm	OSHA 1910.100 Table Z-1, 8 hour TWA	0.1 ppmv	440 ug/m ³	EPA Regional Screening Level*** (RSL) Summary Table April 2012, Industrial Air	GasAlertMicro 5 [®]	0.1 ppmv (70 ug/m ³)

* - could use ambient method if required

** - normal ambient [~390 ppmv]

*** - Residential RSLs will be screened in the assessment report as applicable

**** - Screening levels in vents/sumps may not meet DLs based on gas content

LEL - Lower Exp Limit

ST - Short Term Limit

C - Ceiling

TWA - Time weighted Avg

v/v - volume/volume

ug/m3 - micro gram/cu meter

ppm - part per million

ppb - part per billion

ppbv - part per billion by volume

ppmv- part per million by volume



Figures

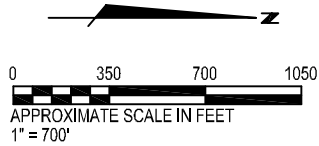
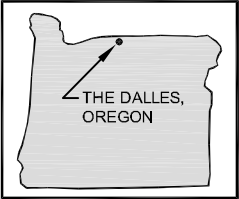


Layout Tab: Aerial Photo (2)

Acad Version : R17.0s (LMS Tech) Date/Time : Fri, 03 Dec 2010 -- 9:51am Current Plotsyle : ByColor
User Name : Mhoefer Path/Name : G:\Common\Matt H\The Dalles\NEW-Aerial Photo Site Map.dwg

LEGEND

- MW-41S + CERCLA LANDFILL MONITORING WELL LOCATION
MW-37S + RCRA LANDFILL MONITORING WELL LOCATION
LOCKHEED MARTIN CORPORATION OWNERSHIP



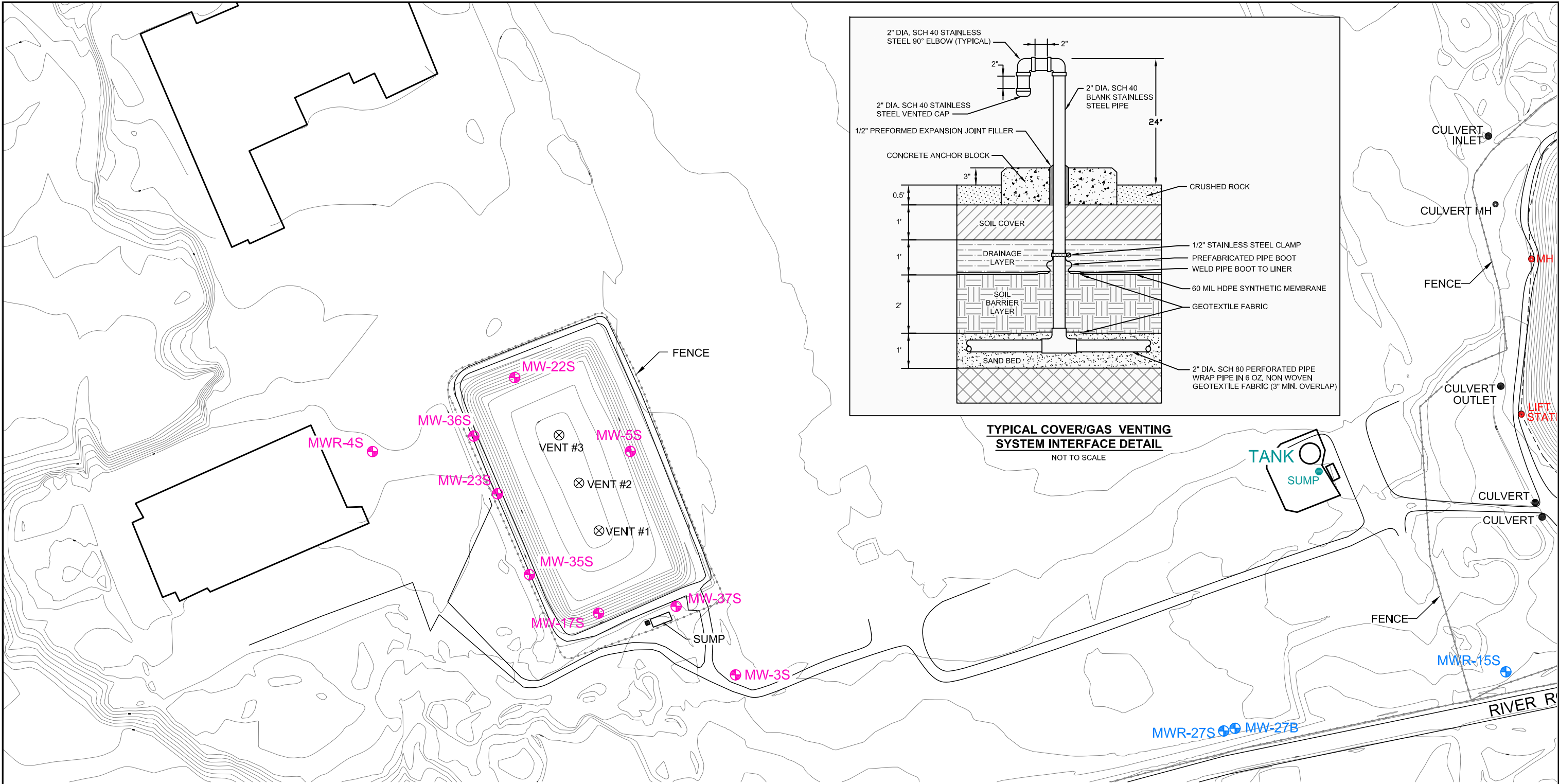
Drafter	M. HOEFER
Project Manager	K.W. SMITH
Task Manager	M. RISHER
Technical Review	M. RISHER / KW SMITH


ARCADIS U.S., Inc.
1610 B Street, Suite 100
Helena, MT 59601
Tel: 406-449-7001 Fax: 406-449-3063
www.arcadis-us.com

LOCKHEED MARTIN CORPORATION
SITE LAYOUT - FACILITIES AND PROJECT AREAS

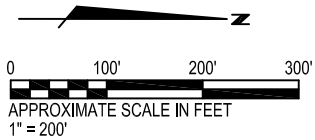
LOCKHEED MARTIN CORPORATION SITE
THE DALLES, OREGON

Project Number	MH000986.0001
Drawing Date	12/03/10
Figure	1

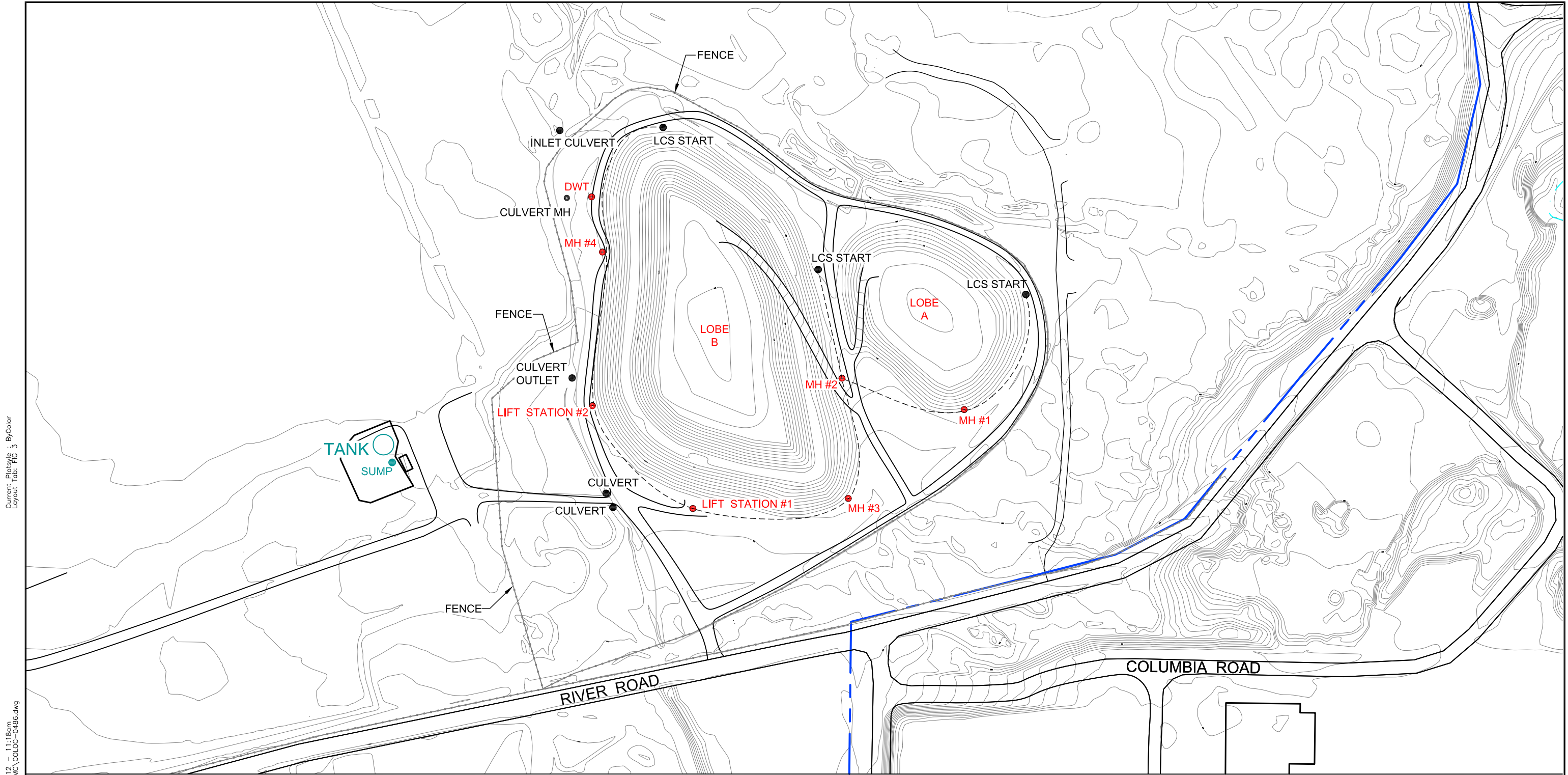


LEGEND

- MW-41S + CERCLA LANDFILL MONITORING WELL LOCATION
MW-37S + RCRA LANDFILL MONITORING WELL LOCATION
MH #4 ● MANHOLE

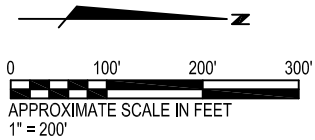


<div><div><div>Drafter M. HOEFER</div><div>Project Manager K.W. SMITH</div><div>Task Manager M. RISHER</div><div>Technical Review M. RISHER / K.W. SMITH</div></div><div><p>Arcadis U.S., Inc. 1610 B Street, Suite 100 Helena, MT 59601 Tel: 406-449-7001 Fax: 406-449-3063 www.arcadis-us.com</p></div></div>		<div>RCRA LANDFILL</div> <div>LOCKHEED MARTIN CORPORATION SITE</div> <div>THE DALLES, OREGON</div>		<div>Project Number GP000677.0015</div> <div>Drawing Date 06/28/12</div> <div>Figure 2</div>
--	--	--	--	--



LEGEND

MH #3 ● MANHOLE



Acad Version : R18.1s (LMS Tech) Date\Time : Fri, 29 Jun 2012 - 11:18am
User Name : M.Hoefer Path\Name : C:\Montana\LMC\COL00-0486.dwg

Drafter	M. HOEFER
Project Manager	K.W. SMITH
Task Manager	M. RISHER
Technical Review	M. RISHER / K.W. SMITH



ARCADIS U.S., Inc.
1610 B Street, Suite 100
Helena, MT 59601
Tel: 406-449-7001 Fax: 406-449-3063
www.arcadis-us.com

CERCLA LANDFILL

LOCKHEED MARTIN CORPORATION SITE
THE DALLES, OREGON

Project Number	GP000677.0015
Drawing Date	06/28/12
Figure	3